Summary of Almost 20 Years of Storm Overflight Electric Field, Conductivity, Flash Rates, and Electric Current Statistics

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We determined total conduction currents and flash rates for around 900 high-altitude aircraft overflights of electrified clouds over 17 years. The overflights include a wide geographical sample of storms over land and ocean, with and without lightning, and with positive (i.e., upward-directed) and negative current. Peak electric field, with lightning transients removed, ranged from -1.0 kV m^{-1} to 16. kV m^{-1}, with mean (median) of 0.9 kV m^{-1} (0.29 kV m^{-1}). Total conductivity at flight altitude ranged from 0.6 pS m^{-1} to 3.6 pS m^{-1}, with mean and median of 2.2 pS m^{-1}. Peak current densities ranged from -2.0 nA m^{-2} to 33.0 nA m^{-2} with mean (median) of 1.9 nA m^{-2} (0.6 nA m^{-2}). Total upward current flow from storms in our dataset ranged from -1.3 to 9.4 A. The mean current for storms with lightning is 1.6 A over ocean and 1.0 A over land. The mean current for electrified shower clouds (i.e. electrified storms without lightning) is 0.39 A for ocean and 0.13 A for land. About 78% (43%) of the land (ocean) storms have detectable lightning. Land storms have 2.8 times the mean flash rate as ocean storms (2.2 versus 0.8 flashes min^{-1}, respectively). Approximately 7% of the overflights had negative current. The mean and median currents for positive (negative) polarity storms are 1.0 and 0.35 A (-0.30 and -0.26 A). We found no regional or latitudinal-based patterns in our storm currents, nor support for simple scaling laws between cloud top height and lightning flash rate.